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(54) Title: A METHOD OF APPLYING TREATMENT CHEMICALS TO A FIBER-BASED PLANAR PRODUCT AND PRODUCTS MADE USING SAME

(57) Abstract: The present invention relates to a method of applying at least one treatment chemical to a fiber-based planar product, in particular tissue, said method comprising the steps of: a) applying water, an aqueous solution or aqueous dispersion to a first surface area (1) of the product, b) allowing the product to swell in the first surface area, c) then applying a treatment composition containing at least one treatment chemical to at least one second surface area (2) of the product, said second area lying within the first area (1), as well as a fiber-based planar product, in particular tissue, obtainable by this method. Uniform swelling within the first surface area, particularly over the entire surface of the planar fiber-based product, prevents the formation of folds (uneven surface) as a result of applying the treatment composition.

A method of applying treatment chemicals to a fiber-based planar product and products made using same

[Specification]

The present invention relates to a method of applying treatment chemicals to fiber-based planar products, particularly tissue, and to the products obtainable in this manner. Within the framework of the present invention, the term "tissue" especially includes "tissue paper" or "raw tissue", as is normally produced as a one-ply tissue web in the tissue (paper) machine, as well as including multiply (intermediate) products, e.g. in the form of multiply doubled webs or in the form of master rolls for further processing and ready-made one-ply and multiply tissue products such as paper handkerchiefs, facials, toilet paper, household towels such as kitchen towels, hand towels and other wipes etc.

[Prior art]

Based on the underlying correspondence of the production processes (wet laying), "tissue" production is counted among the paper making techniques. The production of tissue, or more accurately, raw tissue if the one-ply (intermediate) product manufactured on a special-purpose paper machine of the tissue or tissue paper machine is meant, is delimited from paper production as a result of the extremely low basis weight of normally less than 40 g/m^2 and as a result of the much higher tensile energy absorption index as compared to paper. The tensile energy absorption index is arrived at by relating the working absorbency to the test sample volume before inspection (length, width, thickness of sample between the clamps before tensile load).

Paper and tissue paper also differ in general with regard to the modulus of elasticity that characterizes the stress-strain properties of these planar products as a material

parameter, depending on the production conditions, raw materials used and chemical additives.

A tissue paper's high tensile energy absorption index results from the outer and/or inner creping. The former is produced by compression of the tissue paper web adhering to a dry cylinder as a result of the action of a crepe doctor or in the latter instance as a result of a difference in speed between two successive screens or e.g. between a sheet-forming screen and a so-called fabric or between two fabrics.

When applying the through air drying (TAD) technique for the production of raw tissue and the usual double-screen sheet formation in c-wrap configuration, for example, the so-called inner sheet-forming screen can thus be operated at a speed that is up to 40% faster than that of the next fabric or that of the subsequent felt, the initially formed and already pre-drained paper web being transferred to the next TAD fabric. This causes the still moist and as a result plastically deformable paper web to be internally broken up by compression and shearing, thereby rendering it more stretchable under load than a paper that has undergone neither "internal" nor external creping.

This transfer of a still plastically deformable paper web at a differential speed that simultaneously takes effect may also be brought about in other embodiments between a transfer fabric and the so-called TAD imprinting fabric or between two transfer fabrics.

German has adopted the English-language term "fabric" to designate paper machine covers that exhibit a screen-like fabric structure in which synthetic threads are used as a thread material instead of metal wires.

Most of the functional properties typical of tissue and tissue products result from the high tensile energy

absorption index (see German standards DIN EN 12625-4 and DIN EN 12625-5). An example is represented by tissue products for hygienic applications (hygiene products, particularly hygiene paper products) which are e.g. used in personal grooming and hygiene, the household sector, industry, the institutional field in a very wide variety of cleaning processes. They are used to absorb fluids, for decorative purposes, for packaging or even just as supporting material, as is common for example in medical practices or in hospitals. In terms of their wide variety, hygiene paper products are now considered to be everyday products.

Hygiene paper primarily includes all kinds of dry-creped tissue paper, as well as wet-creped paper.

The one-ply intermediate products originating from the paper machine and made of lightweight, i.e. low basis weight paper usually dry-creped on a yankee cylinder by means of a crepe doctor are generally described as "tissue paper" or more accurately raw tissue paper. The one-ply raw tissue may be built up of one or a plurality of layers respectively.

All one-ply or multiply final products made of raw tissue and tailored to the end user's needs, i.e. fabricated with a wide variety of requirements in mind, are known as "tissue products".

Typical properties of tissue paper include the ready ability to absorb tensile stress energy, their drapability, good textile-like flexibility, properties which are frequently referred to as bulk (crumple) softness, a high surface softness, a high specific volume with a perceptible thickness, as high a liquid absorbency as possible and, depending on the application, a suitable wet and dry strength as well as an interesting visual appearance of the outer product surface. These properties allow tissue paper to be processed into tissue products (tissue paper products) and

are then available to end users in a wide variety of forms and fabrication, for example as wipes, towels, household towels, particularly as kitchen towels, sanitary products (e.g. toilet paper), paper handkerchiefs, cosmetic tissues (facials) or serviettes/napkins.

Depending on the particular application, varied and to an extent conflicting properties are frequently needed for the successful use of tissue products in their extremely broad range of applications.

For this purpose, the tissue is frequently provided with substances, additives, auxiliary substances and other treatment chemicals.

In accordance with the invention, this term will also cover any substance or blends of substances generally referred to as treatment chemicals and normally applied to the tissue after the drying and creping step on the yankee cylinder.

Treatment chemicals may have an influence on physical properties, e.g. softness, particularly bulk softness, strength in the dry and wet states, rate of absorption of liquids, particularly that of water or oil, or the structural strength of the tissue/tissue product itself, and/or they may contribute to their varying use, e.g. in the field of skin care and protection, healthcare, etc. "Lotions" are also particularly referred to in the latter case.

Household towels for example, particularly kitchen towels and to an even greater extent paper towels, require strength, especially in the wet state, and high suction capacity so as to satisfy consumer demands. In the case of toilet paper, a combination of dry strength plus good softness is more likely to determine suitability in practice and acceptance among consumers. In the case of other tissue products such as handkerchiefs or facial wipes, surface softness and excellent

suppleness are predominant properties which, in addition to strength, define the serviceability of these products.

Cosmetic components contained in the product, though particularly present on its outer surfaces also play an important part in the latter tissue products. Such cosmetic components include, inter alia, perfumes, moisturizers, skin care agents, healthcare substances such as panthenol or the active camomile ingredient bisabolol.

It is important in the case of cosmetic components to achieve an optimum transfer of the components such as care agents or moisturizers from the tissue product to the skin - optimum in the sense of an adequate quantity of such components - so as to promote the desired effect. High amounts of the cosmetic substances to be applied to the tissue are necessary for this purpose. On the other hand, the tissue itself must not feel unpleasant or e.g. leave behind a wet feeling on the skin.

Manufacturers of tissue products are therefore especially faced with the challenge of achieving a particular balance between the various, frequently contradictory parameters in order to use this balance to obtain the optimum combinations of features required by consumers for the desired final products. The article entitled "*Weichheit und Weichmachung von Hygiene-Tissue*" in the *Wochenblatt für Papierfabrikation*, No. 11/12, 1988, pages 435 et seq., describes in detail the properties of hygiene tissue and discusses their importance to tissue products in different applications.

Thus, one of the principal market demands to be met by manufacturers is a general improvement in softness in all areas of tissue products. Properties such as the softness of a tissue product are defined in terms of their basic design by the production process, particularly by preliminary TAD and the choice of raw and auxiliary materials.

Softness is an important property of tissue products such as handkerchiefs, cosmetic wipes, toilet paper, serviettes/napkins, not to mention hand or kitchen towels, and it describes a characteristic tactile sensation caused by the tissue product upon contact with the skin.

Although the term "softness" is generally comprehensible, it is extremely difficult to define because there is no physical method of determination and consequently no recognized industrial standard for the classification of different degrees of softness.

To be able to detect softness at least semi-quantitatively, softness is determined in practice by means of a subjective method. To do so, use is made of a "panel test" in which several trained test persons give a comparative opinion.

In simplified terms, softness can be subdivided into its main characteristics, surface softness and bulk softness.

Surface softness describes the feeling perceived when e.g. one's fingertips move lightly over the surface of the sheet of tissue. Bulk softness is defined as the sensory impression that is produced by a tissue manually compressed during the process of compression.

An example of contradictory requirements to be met by tissue manufacturers is shown by the following two documents.

Cream impregnation of multiply toilet paper, for example, suffers from the disadvantage that it reduces the ply adhesion achieved by mechanical means (e.g. as a result of edging).

German utility model DE-U-87 04 537 proposes as a solution to this problem a multiply toilet paper composed of a carrier web exhibiting cream impregnation, this toilet paper being

characterized in that the cream impregnation extends over a principal zone centrally located on the carrier web and adjacent to which there are at least two narrow, non-impregnated marginal zones located on opposites sides of the principal zone. After embossing, the non-impregnated marginal zones ensure adequate ply adhesion.

US 4,481,243 describes multiply tissue paper products that comprise a substrate and a so-called emollient that cares for the skin (as a treatment chemical). The tissue plies are joined by embossments within the marginal zones, the embossing zone being largely free of emollient. This particular document teaches that it is virtually impossible to combine the tissue plies together by means of embossing if the marginal region is not free of emollient.

If the intention is to treat chemically just the inner zone of a tissue so as to avoid an adverse impact on ply adhesion within the marginal areas, various problems nevertheless arise upon application of treatment compositions which swell the cellulose-containing fibers (e.g. pulp fibers) from which the tissue is chiefly made (henceforth also referred to as "swelling the tissue"); examples of such problems include the formation of a wavy surface, uneven distribution of the treatment chemicals present in the treatment composition over the tissue surface, or diminished ply adhesion.

These problems are attributable, on the one hand, to the fact that the swelling process causes the treated surface area, but not the untreated area, to expand. This may lead to the formation of a wavy surface (formation of folds) since only the treated part of the tissue expands and the resultant tension is unable to divert to the untreated zones of the tissue.

It is also observed that due to the preferred configuration of the pulp fibers in the longitudinal direction (machine

direction or MD), the tissue expands in this direction to varying degrees of intensity as compared to the cross direction (CD). This allows the treatment chemicals to migrate faster in the MD, which may lead to an uneven distribution of the treatment chemicals. In this way, the treatment chemical may also reach the marginal zones of the tissue, which e.g. in the case of single-ply and multiply tissues, is undesirable on economical grounds because the amounts applied have to be increased to achieve the desired content within the inner zone or because ply adhesion or the suitability for embossing the plies in the marginal area deteriorates in the case of multiply tissues.

Examples of compounds that may cause tissue to swell are aqueous dispersions (e.g. suspensions or emulsions) and solutions, e.g. glycol/water mixtures. The problem may also arise if just the hygroscopic compounds, such as glycols, are applied, because they attract water that then produces the swelling effect.

These problems may also arise in the case of other fiber-based planar products (e.g. nonwovens), particularly if they include cellulose-containing fibers such as pulp.

[Object of the invention]

The object of the present invention is to make available a method of applying treatment chemicals to a fiber-based planar product, particularly tissue, that reduces or avoids the disadvantages described above.

Another object of the present invention is to provide a planar product that exhibits treatment chemicals, particularly tissue, this product being characterized by a level (non-wavy) surface and the systematic application of treatment chemicals.

This object is solved by a method of applying treatment chemicals to a planar fiber-based product, in particular tissue that comprises the steps of:

a) applying water, an aqueous solution or an aqueous dispersion (e.g. suspension or emulsion) to a first surface area of the planar fiber-based product, in particular tissue,

b) allowing the planar fiber-based product to swell in the first surface area,

c) then applying a treatment composition containing at least one treatment chemical to at least one second surface area of the planar fiber-based product, this second surface area lying within the first area.

The first surface area preferably covers the entire surface area of the tissue.

Pre-swelling within the first surface area of the planar fiber-based product, especially pre-swelling the entire surface, causes the treatment composition to be applied to a previously swollen planar product, particularly tissue.

Uniform swelling within the first surface area, particularly over the entire surface of the planar fiber-based product, also prevents the formation of folds as a result of applying the treatment composition.

In a preferred embodiment the planar fiber-based product is smoothened, e.g. by calendaring, before step (a) and/or after the swelling step (b).

An essential feature of the invention is that pure water, an aqueous solution or aqueous dispersion (e.g. suspension or emulsion) is applied in step (a) (this will also be referred

to as the application of an "aqueous system" in step (a)). The aqueous solution or dispersion preferably contains other constituents that do not result in any substantial increase in viscosity compared to pure water; the viscosity of the aqueous system applied in step (a) is preferably lower than that of the treatment composition applied in step (c). Examples of such constituents that do not increase viscosity too considerably include aqueous linden extract (principal active component quercetin) or low-molecular polyhydroxy compounds such as glycerol, ethylene glycol and propylene glycol in aqueous solution. Aqueous solutions and dispersions that promote the bulk softness of the planar product, particularly tissue, are preferably applied in step (a).

A preferred basic composition for improving softness, particularly bulk softness, comprises the following recipe:

glycerol:	40 - 45 %
propylene glycol:	28 - 30 %
linden extract:	2.5 - 3.5 %
water	up to 100 %

The optional proportion of non-aqueous constituents in the aqueous solution or dispersion applied in step (a) is preferably not more than 90 wt.%, with greater preference not more than 80 wt.%, of the total weight of the solution or dispersion. Depending on the type and purpose of said non-aqueous constituents, the proportion can be not more than 50 wt.% of the total weight of the solution or dispersion, with greater preference not more than 25 wt.%, particularly not more than 5 wt. %. The maximum upper limit may depend, inter alia, on how substantially the component affects the viscosity of the aqueous solution or dispersion, but may also depend on potential influences on ply adhesion in the case of multiply fiber-based planar products, particularly multiply tissue.

The application of the aqueous system in step (a) may be effected for example by using spray devices (e.g. disk-type spray means available from the Weko company, Germany) or by the transfer of an aqueous film with the aid of rolls, e.g. flexographic printing rolls.

In the next step (b), the planar product, particularly tissue, is allowed to start to swell or to swell completely, for example over a period of up to 24 hours.

In an embodiment of step (b), the entire planar product is conditioned in a moist atmosphere. Conditioning may be followed by the application of other treatment chemicals (see for example the following list) throughout the entire surface area, particularly the addition of treatment chemicals that bestow bulk softness, e.g. a mixture of glycerol and propylene glycol.

Very short periods may, however, be sufficient to (start to) swell the planar product, especially tissue. If for example the raw tissue web is guided past the application devices at the normal (high) speeds during tissue making, periods of a few msec up to e.g. 30s may suffice to trigger the swelling effect produced by the water.

In step (c) a treatment composition that contains at least one treatment chemical is applied at least to one so-called "second surface area" located within the first surface area. The applied treatment composition is preferably a cosmetic lotion or an agent that bestows surface softness, as will be explained below.

The phrase "within the first surface area" means that the second surface area is smaller than the first surface area. In accordance with the invention, provision can also be made for a plurality of "second surface areas" located within the first surface area. The second area preferably extends across

the center of the tissue surface. A rectangular or quadratic tissue makes it particularly preferable for the second surface area to keep a distance from at least two (preferably opposite), particularly four sides of the tissue. This thus produces two, particularly four untreated striped marginal zones which in the latter case preferably form a continuous circumferential frame-like marginal zone.

Tissue formats other than rectangular or quadratic ones also make it preferable for the second surface area to keep a distance from the edges of the planar product, particularly tissue, by means of a circumferential marginal zone.

If the intention is to have the marginal zones adhere the plies together in a multiply planar product, particularly tissue, optionally by means of contact pressure (e.g. embossing) or use of adhesion (gluing), a sufficient width is selected for the marginal zone.

In the case of web-like products, e.g. rolls of toilet paper or rolls of kitchen paper, work preferably proceeds with two striped marginal zones parallel to the MD, in which zones edging is possible. In the case of individually fabricated products, e.g. facial tissues or handkerchiefs, work preferably proceeds with a continuous circumferential frame-like marginal zone in which edge embossing is possible.

The treatment composition may comprise a single treatment chemical or a blend of at least two treatment chemicals. This composition may also contain compounds that have no influence or only a slight influence on the properties of the treated planar product, particularly tissue, e.g. solvents (such as water and/or alcohol), auxiliary substances and/or additives. It may therefore be present e.g. as an aqueous solution or dispersion (e.g. suspension or emulsion) or comprise one or more treatment chemicals (water not included). Water may, however, also be an important active constituent of the

treatment composition, particularly in cosmetic lotions intended to achieve a pleasant moist sensation on the skin. Water is then preferably used in combination with hygroscopic compounds. Depending on the treatment composition's function, the proportion of optionally present solvents (including water) in the composition is preferably less than 60 wt.%, with greater preference on less than 30 wt.%, even greater preference on less than 10 wt.%, particularly less than 5 wt.%, each relative to the total weight of the composition.

To reduce migration, work preferably proceeds with treatment compositions that contain less water (in terms of wt.% relative to the total weight) compared to the aqueous system applied in step (a). There is greater preference for the treatment composition to contain only as much water as bound by the other components under normal conditions (room temperature, i.e. 20°C, and humidity values typical of Central Europe, approx. 30-70% humidity, e.g. 50%). Even greater preference is given to applying the treatment chemicals as an individual compound or as a blend of compounds that are essentially anhydrous. Cosmetic lotions as explained below are an example of such treatment compositions that usually contain an "equilibrium amount" of water (because of water's aforementioned moisturizing effect) or that are essentially anhydrous.

The treatment chemical(s) may be selected from the following compound classes or compounds.

Agents for skin care and protection, so-called cosmetic lotions such as

- moisturizers, such as substituents for the skin's natural moisturizing factor (NMF) that contain e.g. cleavage products of collagen, glycerol etc.;
- skin care agents, e.g. long-chain fatty acid esters (like sorbitan fatty acid ester or Cetiol®), lanolin or derivatives thereof;

- fragrances, e.g. natural, naturally identical or artificial perfumes; and/or
- active cosmetic ingredients like D-panthenol or the active camomile ingredient α-bisabolol or

agents exhibiting other functions, e.g.

- strength-enhancing agents, particularly wet-strength agents like epichlorohydrin resins or crosslinked polyalkylene amines,
- agents that promote the softness (e.g. bulk softness or surface softness) of the planar product, particularly the tissue; e.g. a polyhydroxy compound (e.g. ethylene glycol, propylene glycol, a liquid polyethylene glycol (derivative), a liquid polypropylene glycol (derivative) and/or glycerol), also quaternary ammonium compounds as described e.g. in US 5,312,522 or 5,397,435 and the prior art cited therein, optionally in combination with the polyhydroxy compounds described in both these documents; or a poly(siloxane), particularly the (poly)siloxanes described in EP-A-347 153 and EP-A-347 154,
- surfactants used e.g. as absorption rate control agents, e.g. long-chain quaternary ammonium compounds that may also exhibit softness-promoting action,
- waxes, oils, and/or
- inorganic or organic pigments or dyes.

If treatment compositions that contain hygroscopic compounds e.g. the aforementioned polyhydroxy compounds, but not the full equilibrium amount of water, are applied in step (c), amounts of water that exceed the hygroscopic compound's water absorbency are preferably used in step (a) for the purpose of pre-swelling so as not to induce different swelling properties in the second surface area and its surrounding area (part of the first surface area) as a result of the dehydrating action of the hygroscopic substance.

The total amount of nonvolatile treatment chemical(s) applied in the first and second surface areas of the planar product,

particularly tissue, is preferably 0.01 to 50 wt.%, with greater preference on 0.5 - 45 wt.% and even greater preference on 0.75 - 40 wt.%, relative to the weight of the untreated oven-dried planar product, particularly tissue (oven-dried being understood in accordance with German standard DIN EN 20638). Even greater preference is given to values of 1-35 wt.%, particularly 2-30 wt.% and 5-15 wt.% (what is considered to be volatile is any component that volatilizes upon further processing of the planar product, especially tissue, e.g. solvent such as water, unless it is intended to remain in the composition, e.g. a cosmetic lotion.).

As regards application of the treatment composition, a suitable application technique, depending on the form of application (e.g. concentrated solution, dispersion or emulsion, or pure substance), is chosen in a manner known to specialists. For example, it is possible to resort to roll or spray application techniques. When applying high-viscosity treatment compositions, pressure rolls (e.g. direct gravure printing screen rolls optionally in combination with a comb-type doctor blade) are particularly suitable, as are calenders optionally modified for film transfer. Solids (e.g. waxes) can also be heated to convert them into the liquid state and apply them in this form.

In a conventional single-felt or double-felt tissue machine, the treatment composition can be applied for example by supplying it, e.g by means of spray application, onto the moist fibrous mat after its transfer to the transport (dry) felt before the yankee cylinder.

After application of the treatment composition in the second surface area, preference is given to drying the planar product, particularly tissue, e.g. by means of contact or convection drying. The planar product can also be dried in ambient air.

To produce multiply tissues, individual areas, particularly marginal regions of several superimposed tissue plies, can be joined together by use of adhesion (gluing) and/or by means of contact pressure (e.g. edging, embossing). The adhered and/or mechanically joined surface areas preferably should not overlap with that surface area (the "second" surface area) to which the treatment composition was applied, since many treatment chemicals, e.g. emollients such as polyhydroxy compounds or (poly)siloxanes, adversely affect ply adhesion.

In this preferred embodiment, the method according to the invention therefore facilitates the mechanically produced ply adhesion in multiply products, e.g. multiply tissue.

Embossing preferably occurs in the tissue's dry state and can be implemented before or after steps a to c.

To reduce migration of the treatment chemical even more considerably, the edge of the treated ("second") surface area is provided, in a special embodiment of the invention, with a barrier zone (e.g. in the shape of a stripe or frame) that isolates the second surface area from that part of the first surface area which extends beyond it. The use of a barrier zone is particularly suitable if in the case of multiply planar products such as multiply tissue, the intention is to produce ply adhesion in marginal zones that are to be separated, by means of the barrier zone, from the second surface area. In the case of web-shaped products such as toilet paper rolls or kitchen paper rolls, work preferably proceeds with two striped barrier zones that separate the two marginal zones, parallel to the longitudinal direction (MD), from the second surface area (here the web-shaped zone extending in the middle of the web). In the case of individually fabricated products such as paper handkerchiefs or facials, the barrier zone preferably completely surrounds the second surface area. In the case of multiply products,

e.g. multiply tissue, the barrier zone may be limited to one ply. It is, however, preferred if this zone penetrates every ply, i.e. it extends perpendicular to the surface.

For reasons of economy, narrow striped barrier zones are preferably adopted, four "strips" together being able, as mentioned, to form a frame in the case of rectangular products. In the case of products with a different shape, e.g. round products, the shape of the barrier zone can be adapted to this shape, i.e. it can for instance form a round frame. The width of the barrier zone is preferably 0.5 - 20 mm, with greater preference on 1 to 15 mm, even greater preference on 2 to 10 mm, particularly 3 to 5 mm. The barrier zone is preferably applied before step (a), i.e. to the still dry planar product, particularly tissue.

The barrier zone can be produced for example by substantially compacting (squashing) the fibers. Preference is nevertheless given to producing the barrier effect by chemical means, by selecting a substance or substance blend exhibiting a barrier effect as regards the applied treatment chemical(s). For example, a barrier zone composed of hydrophobic substances such as fat, oil, silicone oil and/or wax, exhibits a barrier effect particularly as regards hydrophilic treatment chemicals.

In a further preferred embodiment of the claimed method relating to the production of multi-ply products (in particular multi-ply tissues), a barrier layer is provided between the outer plies of the product. This barrier layer may be made from a plastic film which reduces or prevents the migration of treatment compositions. Alternatively it can be a nonwoven or paper (also tissue paper) material, which preferably contains or consists of hydrophobic fibers in order to reduce or prevent the migration of treatment compositions. In this embodiment the other (non-barrier) plies are subjected to the method of the invention and then

joined together with the barrier ply according to conventional laminating methods.

The present invention also relates to a fiber-based planar product that contains a treatment composition; this product can be obtained according to a method that comprises the steps described above The term "fiber-based planar product", as used here, stands for planar products made of fibers (especially fibers that contain cellulose, such as pulp), for example nonwovens or tissues, with tissue representing a particularly preferred embodiment.

The fiber-based planar product is in a dry state, when using the method of the invention. In the case of tissue materials, either the raw tissue as obtained after the drying and creping step at the Yankee cylinder or a further processed (dry) tissue product can be employed. "Dry" means that the fiber-based planar product, in particular tissue material preferably has a moisture content of less than 10%.

The term "tissue" as defined by the present invention is understood as any kind of creped paper made from an aqueous dispersion and having a basis weight range of usually between 10 and 65 g/m^2. In accordance with the invention, the term "tissue" covers both

- the entire range of raw creped paper, also known as "raw tissue", particularly the range of dry-creped raw tissue paper, regardless of whether they are single-layer or multilayer,
- and any single-layer or multilayer end products made of this creped raw paper.

"Raw tissue" is usually made as a one-ply tissue web in the tissue (paper) machine or as an optionally multiply (intermediate) product, e.g. in the form of multiply doubled webs or in the form of master rolls for further processing. The term "layers" refers to a change in chemical and/or

physical properties within a tissue ply; such a change may be caused e.g. by a different fiber composition. In contrast to plies, layers usually cannot be separated from one another.

The final product is preferably

- a cleaning wipe, e.g. wiping paper, a windscreen cleaning wipe, a cleaning wipe for industrial applications, a towel or a cleaning wipe for household use, e.g. kitchen paper;
- a sanitary product, e.g. toilet paper (also moist);
- a paper handkerchief (also moist);
- a household towel, e.g. kitchen towels;
- a towel;
- a tissue for facial use, e.g. a makeup removal tissue (facial) or cosmetic tissue,
- a serviette/napkin,
- bed linen;
- a garment, e.g. disposable apparel for hospitals or kitchen staff.

Particularly preferred tissue products are handkerchiefs, tissues for facial use, sanitary products (e.g. toilet paper) and towels in which the application of cosmetic treatment compositions and/or treatment compositions that convey softness (lotions) plays a part.

The term tissue paper must also be regarded independently of the fibrous raw material to be used, particularly irrespective of whether the fibrous raw material is made solely or mainly from natural pulps e.g. according to the sulfate or sulfite process, or is used in a mixture with chemothermomechanical wood pulps (e.g. CTMP, or HTCMP), or whether the fibrous raw material used comes from a secondary fiber refinement process and whether the fibrous raw material needed to make tissue therefore completely or partially comprises "recycled fibers".

To distinguish from nonwovens, it should be noted that although the predominant use of natural (cellulose-containing), i.e. vegetable, pulp fibers broken up in a manner suitable for paper making is typical of tissue paper manufacturing, a proportional use by refinement of modified pulp fibers in a range of 10 to 50 %, relative to the total weight of the fibers, or even a use of synthetic fibers suitable for paper making in an amount of 10 to 30 % are covered by the aforementioned definition of the term "tissue". It is analogously possible to apply the method beyond the field of paper making to corresponding fields in the nonwoven and textile sectors.

Upon application of the treatment composition, it is possible to start out e.g. from a multiply, usually two-ply to four-ply or multiply (doubled) master roll produced in a separate doubling machine. A plurality of one-ply tissue webs can alternatively be treated (one unwinding each) and then jointly rolled up into a multiply tissue product via a roll-up device. This produces the advantage that e.g. the inner plies can be treated with a treatment chemical other than that for the outer plies. For example, the inner plies of a four-ply end product can remain untreated, or can be treated with a strength-enhancing agent, whereas the two outer plies were treated with a treatment chemical to improve surface softness. In principle, an extremely wide variety of combinations of differently treated tissue plies is conceivable.

In one embodiment, the tissue is a four-ply or three-ply doubled raw tissue for making handkerchiefs or facials, the tissue being made available in the form of master rolls for the application of a treatment agent in a processing machine suitable for this purpose. The processing machine comprises at least one unwinding device for the master rolls, a roll-up device for the product finished after application of a

treatment agent, and an interposed applicator for applying the treatment agent.

Preference is given to making a planar product that particularly exhibits bulk softness, particularly tissue, e.g. using the bulk softeners explained above and/or by choosing the raw materials in a manner known to specialists.

There is greater preference for the planar product according to the invention, especially tissue, to exhibit surface softness, as can be achieved for example by application of the (poly)siloxanes according to EP-A-347 153 and EP-A-347 154, and for it to exhibit bulk softness.

The invention will now be explained in further detail by means of an illustration. **Fig. 1** is a diagrammatic illustration of a preferred embodiment of the invention. The reference numbers in the illustration represent the following:

(1) the "first" surface area
(2) the "second" surface area
(3) a circumferential marginal zone
(4) a narrow barrier zone.

The illustration explains a planar product, (e.g. tissue), and an application method wherein the entire surface (first surface area (1) composed of the surface areas (2) and (3)), was swollen with water. The treatment chemical(s) were then applied to the inner surface (2), the "second" surface area. The marginal zone (3) of the tissue is embossed. To impede the migration of treatment chemicals from the inner surface (2) to the marginal zone (3) as far as possible, a narrow (frame-like) barrier zone (4) is also provided between the inner zone (2) and the marginal zone (3).

To explain the present invention further, reference is also made to the introductory portion of the specification where properties of, and production processes for, tissues are described.

The method according to the invention makes it possible to manufacture fiber-based planar products, particularly tissue, in which problems usually caused by swelling upon addition of water are lessened or eliminated, e.g. a wavy surface that impairs the product's appearance. Depending on the function, the treatment chemicals may also develop their optimum effect in the products according to the invention.

Claims

1. A method of applying at least one treatment chemical to a fiber-based planar product, said method comprising the steps of:

   a) applying water, an aqueous solution or aqueous dispersion to a first surface area (1) of the product,

   b) allowing the product to swell in the first surface area,

   c) then applying a treatment composition containing at least one treatment chemical to at least one second surface area (2) of the product, said second area lying within the first area (1).

2. A method according to claim 1, wherein the first surface area (1) essentially extends across the entire surface of the product.

3. A method according to claim 1 or 2, wherein the second surface area (2) extends across the middle of the surface of the product and maintains a distance from at least two sides of a rectangular or quadratic fiber-based product.

4. A method according to at least one of claims 1 to 3, wherein the second surface area maintains a distance from the sides of the product by means of a circumferential marginal zone (3).

5. A method according to at least one of claims 1 to 4, wherein the treatment composition is applied in a printing process to said second surface area (2).

6. A method according to at least one of claims 1 to 5, wherein the treatment composition comprises at least one of the following constituents:
moisturizers, skin care agents, fragrances, active cosmetic ingredients, strength-enhancing agents, agents that promote the softness of the product, surfactants, waxes, oils, inorganic or organic pigments or dyes.

7. A method according to at least one of claims 1 to 6, wherein the total amount of the (treatment) chemical(s) applied within the first and second surface areas is 0.01 to 50 wt.% relative to the planar product, particularly tissue (oven dried).

8. A method according to at least one of claims 1 to 7, wherein the second surface area (2) is surrounded by a narrow barrier zone (4).

9. A method according to claim 8, wherein the barrier zone (4) is produced by applying at least one hydrophobic substance to the planar product.

10. A method according to claim 9, wherein the hydrophobic substance comprises fat, oil, silicone oil and/or wax.

11. A method according to at least one of claims 1-10, wherein the planar product is tissue.

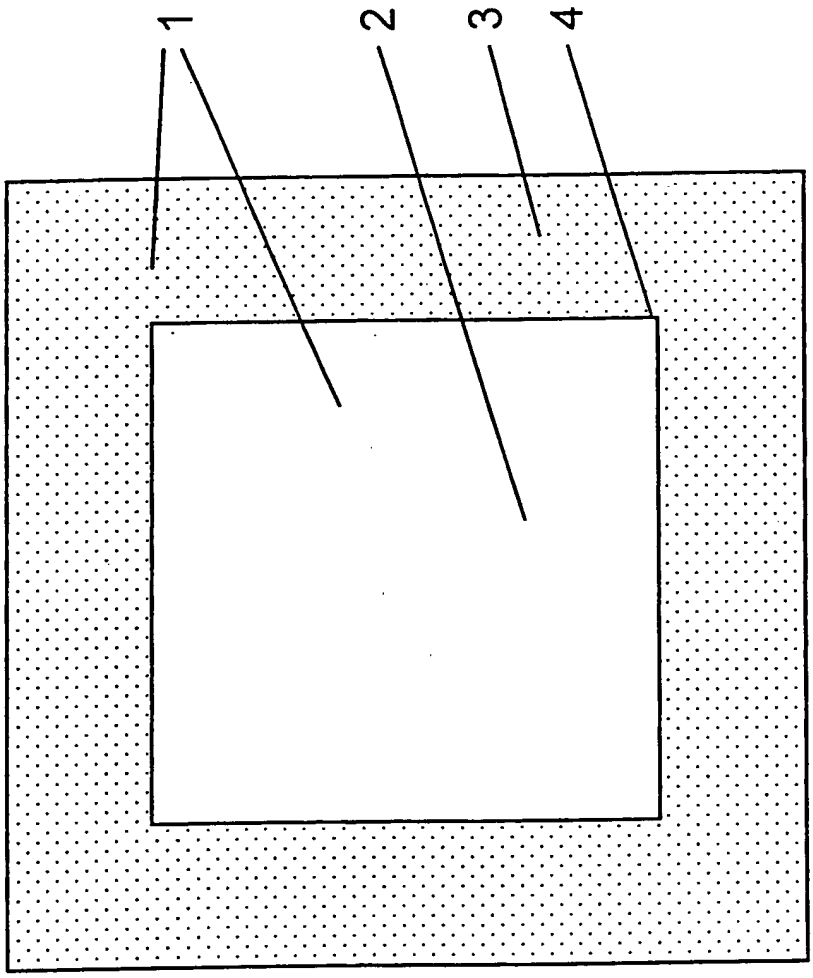
12. A fiber-based planar product obtainable according to a method comprising the steps according to at least one of claims 1-11.

13. A planar product according to claim 12, said product being a tissue product.

14. A tissue product according to claim 13, said product being in the form of a cleaning wipe, sanitary product,

paper handkerchief, tissue for facial use, a napkin/serviette, bed linen or a garment.

Figur 1



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(54) Title: A METHOD OF APPLYING TREATMENT CHEMICALS TO A FIBER-BASED PLANAR PRODUCT AND PRODUCTS OBTAINED BY SAID METHOD

(57) Abstract: The present invention relates to a method of applying at least one treatment chemical to a fiber-based planar product, in particular tissue, said method comprising the steps of: a) applying water, an aqueous solution or aqueous dispersion to a first surface area (1) of the product, b) allowing the product to swell in the first surface area, c) then applying a treatment composition containing at least one treatment chemical to at least one second surface area (2) of the product, said second area lying within the first area (1), as well as a fiber-based planar product, in particular tissue, obtainable by this method. Uniform swelling within the first surface area, particularly over the entire surface of the planar fiber-based product, prevents the formation of folds (uneven surface) as a result of applying the treatment composition.

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
PAJ, WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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[X] Further documents are listed in the continuation of box C.

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